



DISTILLERS GRAINS TECHNOLOGY COUNCIL

"Increasing the awareness of the value of Distillers Grains"



IOWA STATE UNIVERSITY

Distillers Grains: Value-Added Opportunities

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Distillers Grains Technology Council
Iowa State University
Ames, IA USA



OVERVIEW

1. Distillers Grains Technology Council
2. Motivations
3. Key Issues & Challenges
4. Evolving Processes & New Opportunities
5. Other Issues

Seagram's



Hiram Walker & Sons



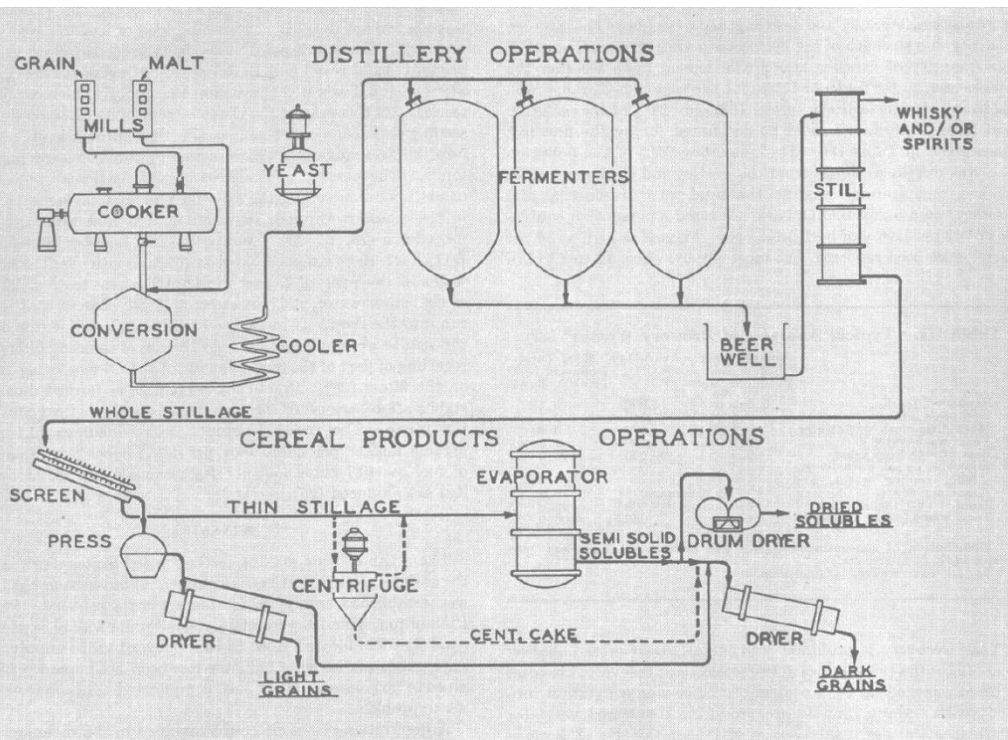
DISTILLERS GRAINS TECHNOLOGY COUNCIL

DISTILLERS GRAINS TECHNOLOGY COUNCIL

- Late 1800s
 - Distillers coproducts increasingly used in animal feeds (not rivers anymore...especially Kentucky)
- 1913
 - First AAFCO definition for DDGS
 - Exports to Europe occurring
- 1945
 - Seagram's Distillers Corporation hosted a meeting of industry, university and government attendees to discuss feed uses of distillery coproducts
 - Distillers Feed Research Council founded
 - Cincinnati, OH
 - Feeding trials, research, annual symposium

DISTILLERS GRAINS IN ANIMAL FEEDS

- “Grain distillers have developed equipment and an attractive market for their recovered grains” (Boruff, 1947)
- “Distillers are recovering, drying, and marketing their destarched grain stillage as distillers dried grains and dried solubles” (Boruff, 1952)



DISTILLERS GRAINS TECHNOLOGY COUNCIL



Distillers Feed Research Council Meeting,
March 15, 1951, Cincinnati, OH



Distillers Feed Research Council Meeting,
January 24, 1950, Cincinnati, OH

WHAT DO WE DO?

- Our Mission

The goals of our organization encompass a broad interest in current issues affecting the beverage, fuel, and livestock industries

- Service Support

To provide educational and technical services to member producers and users of distillers grains

- Advocacy

To be the principle voice on nutrition, safety, and regulatory issues affecting distillers grains

- Market Development

To encourage, administer, and support research and promotion into new and existing market opportunities for distillers grains, and advancing the awareness of coproduct value



19th Annual Distillers Grains Symposium

*Researching and promoting the value of distillers grains
for the fuel and beverage alcohol industries since 1945*



May 13-14, 2015

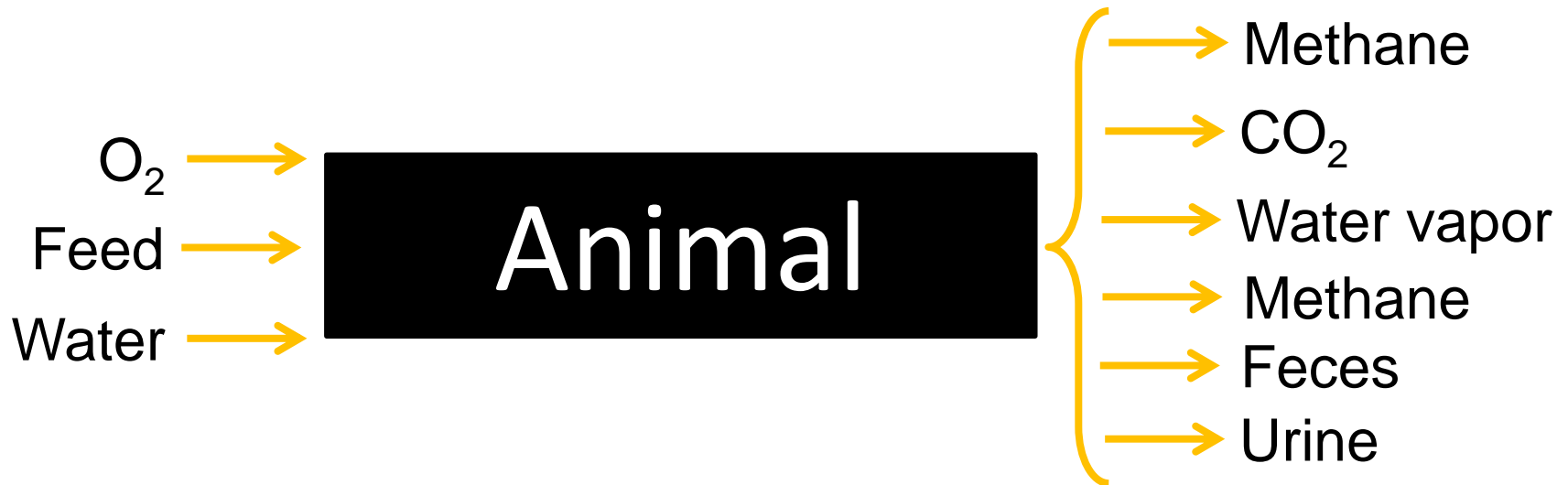
Sheraton Crown Center
Kansas City, Missouri



MOTIVATIONS

MOTIVATIONS

- Ruminants or monogastrics



MOTIVATIONS

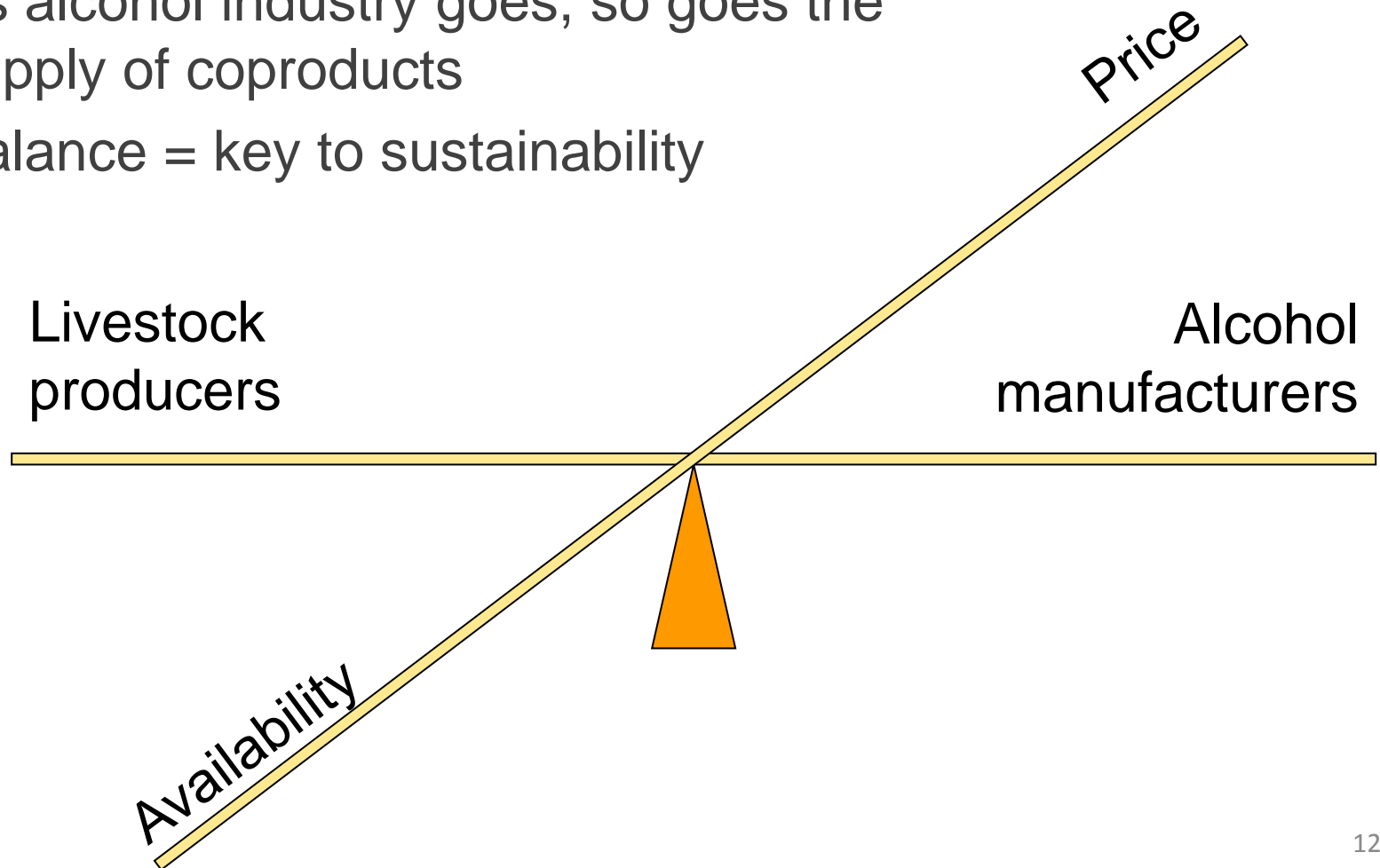
Alcohol



Non-fermentable components

DDGS IN THE MARKETS

- As alcohol industry goes, so goes the supply of coproducts
- Balance = key to sustainability





KEY ISSUES & CHALLENGES

ISSUES AND CHALLENGES

- “Mountains of distillers grains”
- Optimizing livestock feed
 - Current generation products
 - Next generation products
 - Processed feeds
 - New species
- Transportation & logistics
 - Domestic
 - International
- **Optimizing quality** w/
alcohol



- Mycotoxin contamination
- Sulfur / phosphorus levels
- Energy consumption / cost
- FDA

PROPERTIES & QUALITY = KEY

ISSUES AND CHALLENGES

- Variability negatively impacts sales of DDGS
 - Livestock producers need consistent feed products
 - Inconsistent quality – not good for animals!
- Nutrient content & quality
 - Digestibility
 - Heat damage
 - Residual starches and sugars
- Physical properties
 - Particle size, flowability

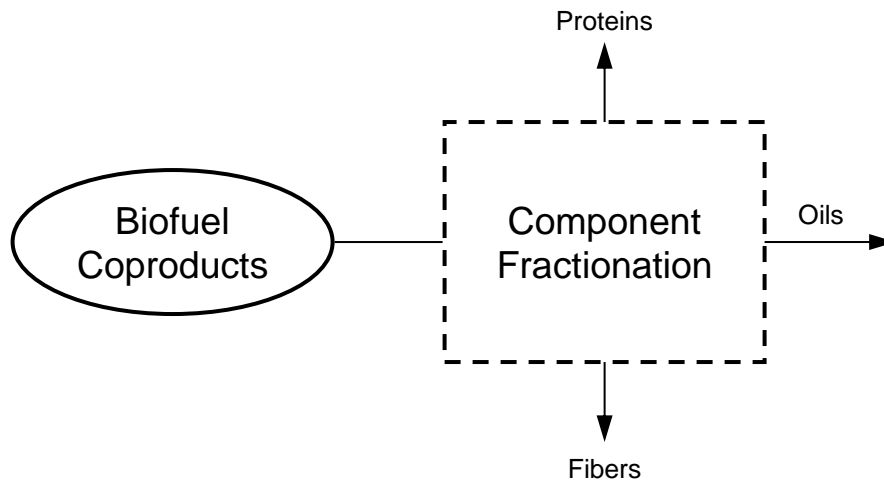




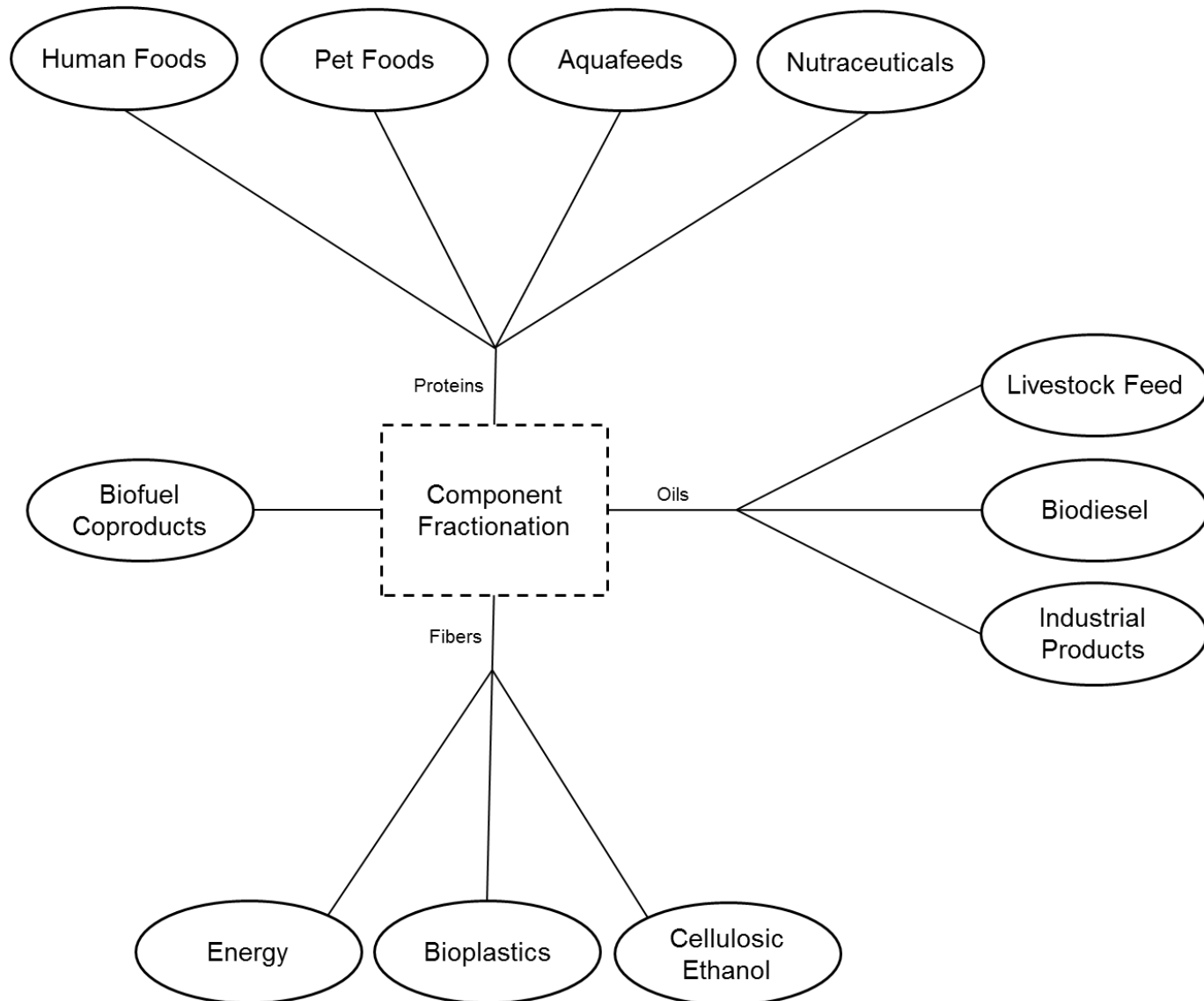
EVOLVING PROCESSES & NEW OPPORTUNITIES

FRACTIONATION

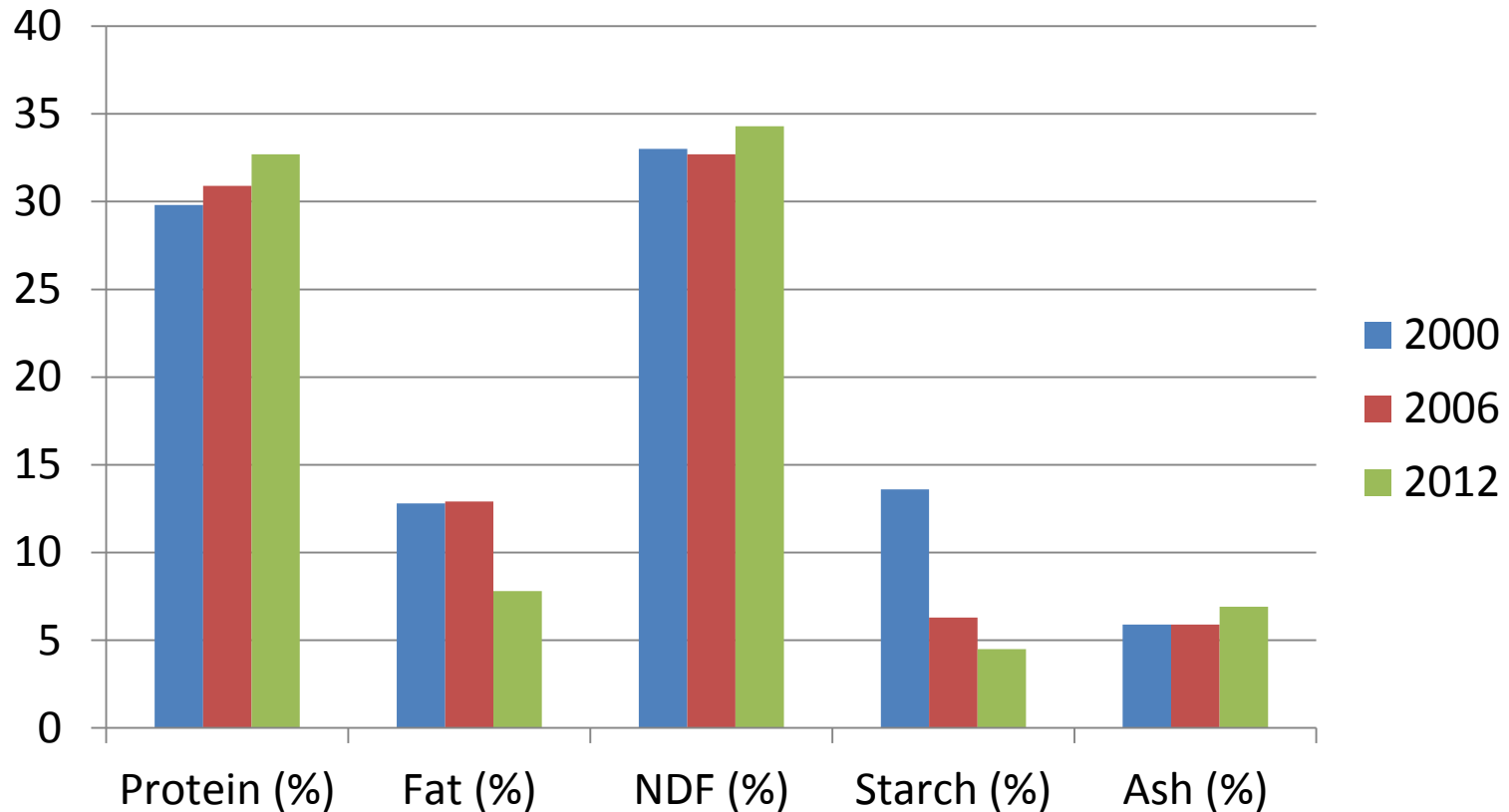
What else
besides
livestock feed?



FRACTIONATION

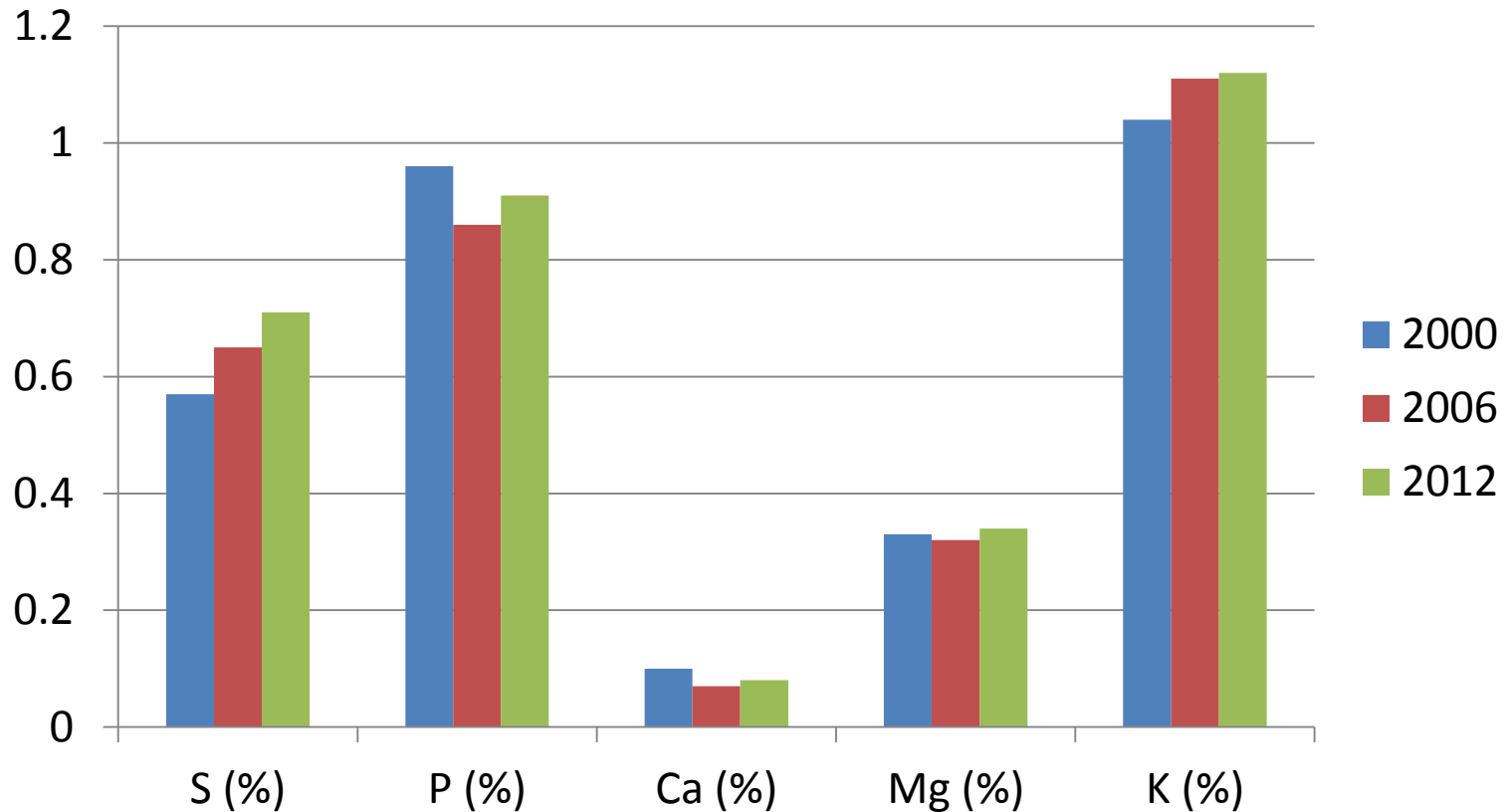


EVOLVING COPRODUCTS



Source: Dairy One, 2015

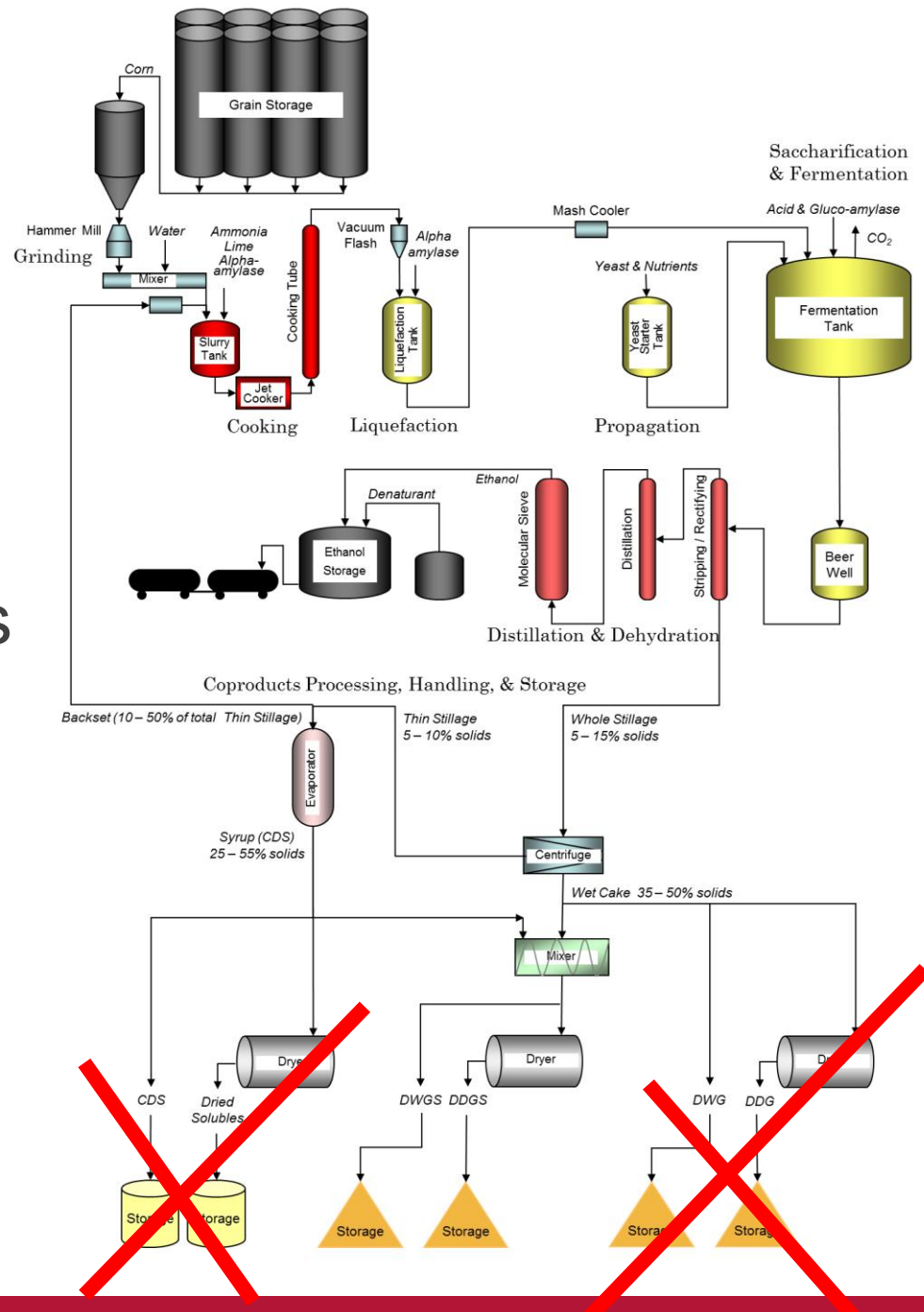
EVOLVING COPRODUCTS



Source: Dairy One, 2015

EVOLVING PROCESSES

- Fractionation (pre- vs. post-fermentation)
- Wet vs. dry coproducts
 - DWGS vs. DDGS
- Reduced coproduct options



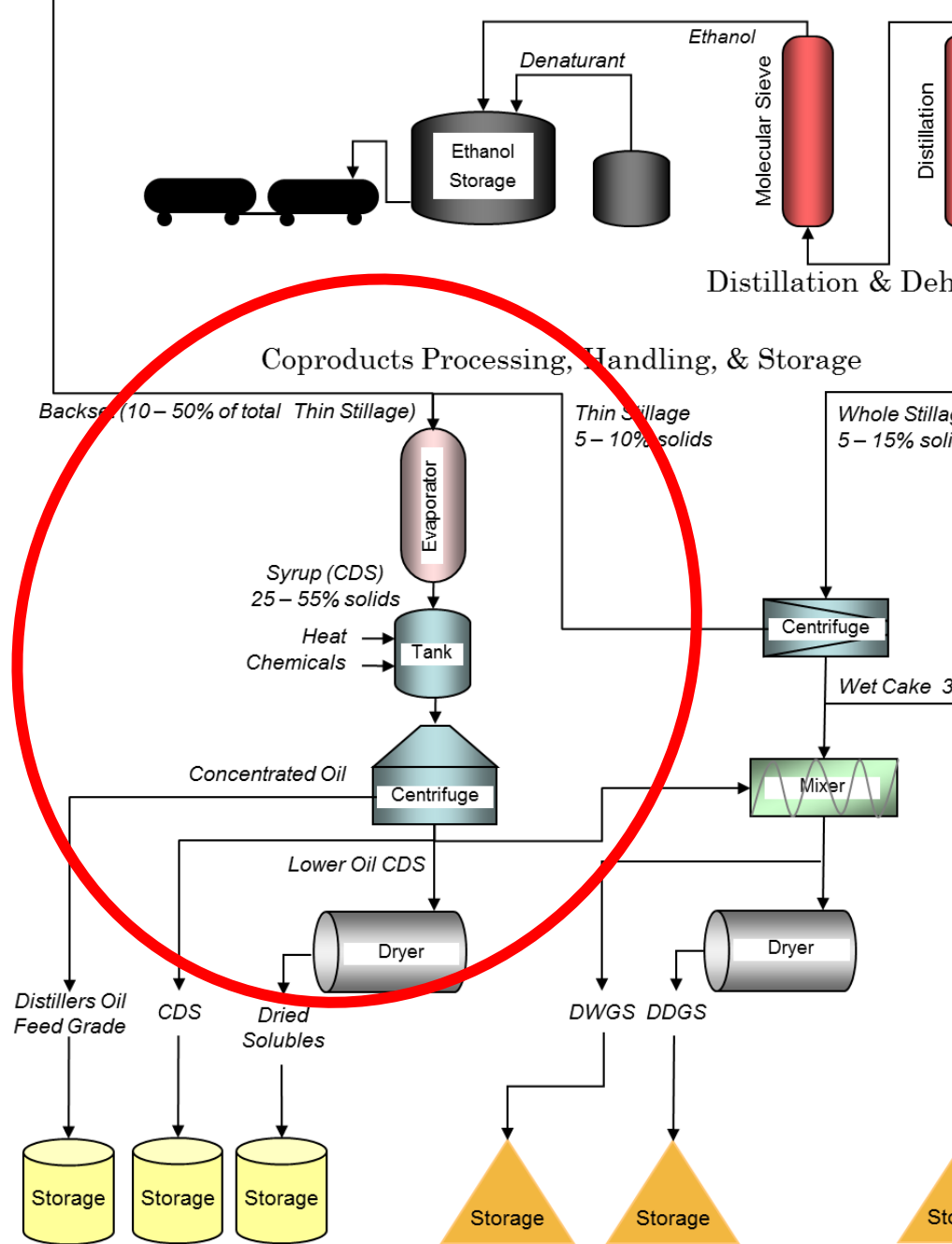
EVOLVING COPRODUCTS

Co-products and Products	Dec 2014	Jan 2014	Feb 2015
Dry Mill			
Condensed distillers solubles (CDS-syrup)	172,082	162,626	128,057
Corn oil	97,380	105,356	96,347
Distillers dried grains (DDG)	448,551	438,936	405,025
Distillers dried grains with solubles (DDGS)	1,919,823	1,862,550	1,649,534
Modified distillers wet grains (DWG) <65% moisture	1,411,411	1,341,938	1,144,177
Modified distillers wet grains (DWG) 40-64% moisture	503,258	480,134	421,666
Wet Mill			
Corn germ meal	75,031	71,492	48,546
Corn gluten feed	329,431	321,768	283,990
Corn gluten meal	94,777	90,617	80,855
Corn oil	44,551	41,961	41,020
Wet corn gluten feed 40-60% moisture	338,077	313,400	274,763

NASS/USDA MONTHLY CO-PRODUCTS PRODUCTION

EVOLVING PROCESSES

- Oil extraction
 - New enzymes
 - New chemicals
 - New treatments



EVOLVING PROCESSES

- Oil extraction from CDS or stillage (40-60 cents/lb)
 - 10-12% down to 5-8% fat
 - Every 1% fat reduction = \$3-\$6 /ton finisher diet increase
 - Jan. 2012: 47% of ethanol plants extracting oil
 - Aug. 2014: ~85%



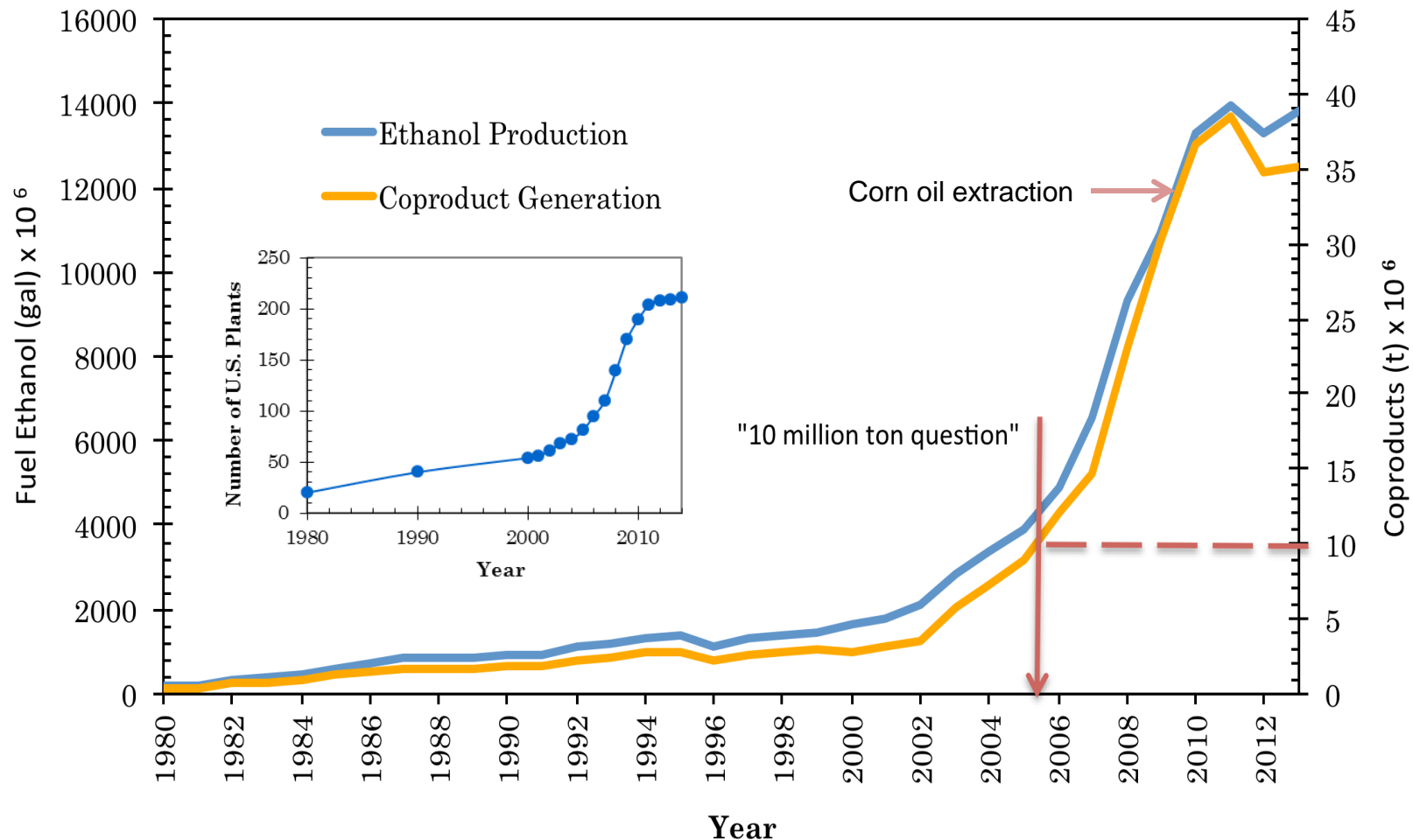
Now:

1 bu corn =

2.8 gal alcohol
+ 18 lb CO₂
+ 16 lb DDGS
+ 1 lb oil



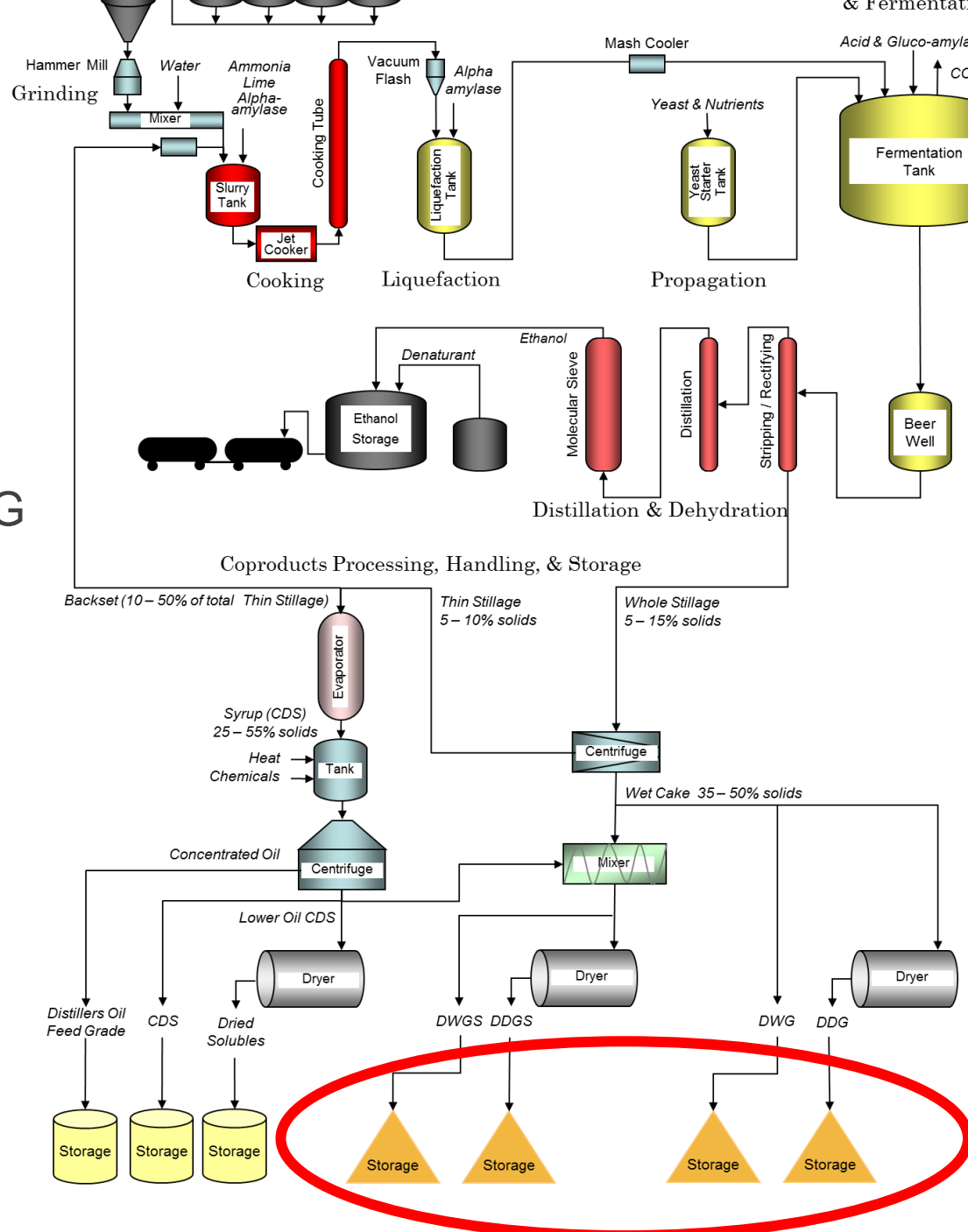
U.S. ETHANOL GROWTH



Growth of U.S. fuel ethanol industry

EVOLVING PROCESSES

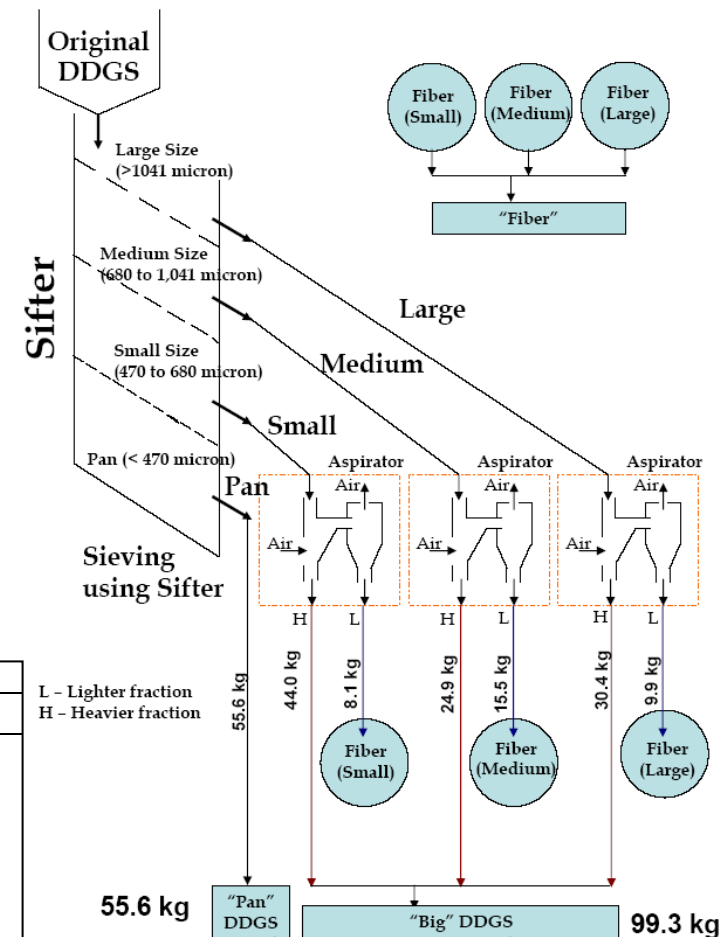
- Fiber & protein separation
 - From the DDGS or DDG



DDGS FRACTIONATION



a) Original DDGS; b) big DDGS; c) pan DDGS



Property	Big		Original		Pan	
	Mean	St Dev	Mean	St Dev	Mean	St Dev
Protein	31.85 a	1.06	33.00 a	0.99	37.25 b	0.21
Lipid	8.65 a	0.07	7.95 b	0.07	7.00 c	0.01
Ash	4.70 a	0.01	4.70 a	0.01	5.00 b	0.01
Carbohydrate	54.80 a	1.13	54.35 a	0.92	50.75 b	0.21
ADF	11.60 a	0.71	12.40 b	0.57	11.45 a	0.07
NDF	34.55 a	0.49	37.80 b	0.14	29.15 c	0.21

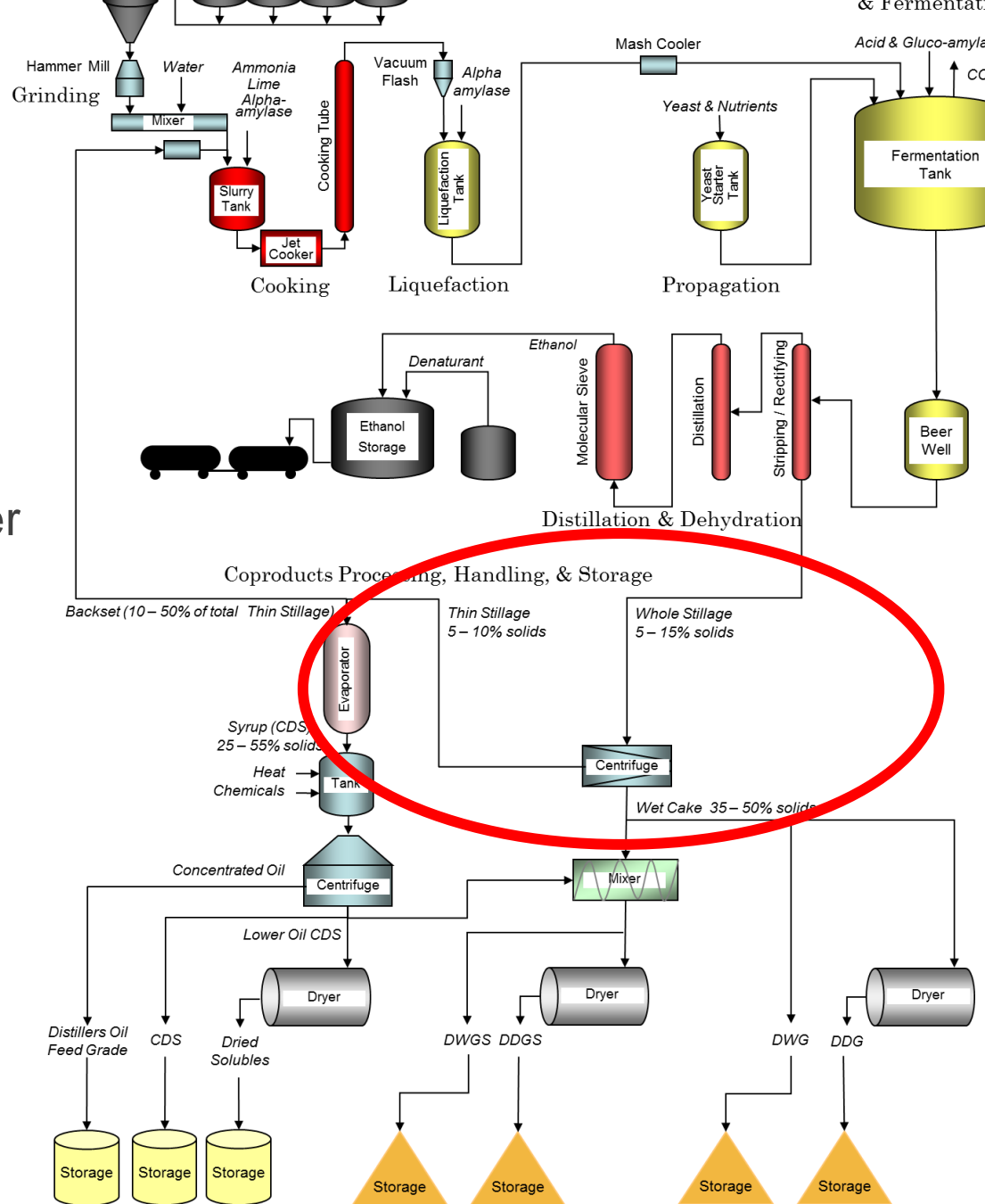
DDGS FRACTIONATION

DDGS fiber

- Protein: 42% db
- Lipid: 1.7% db
- NDF: 52% db
- Ash: 4.0% db

EVOLVING PROCESSES

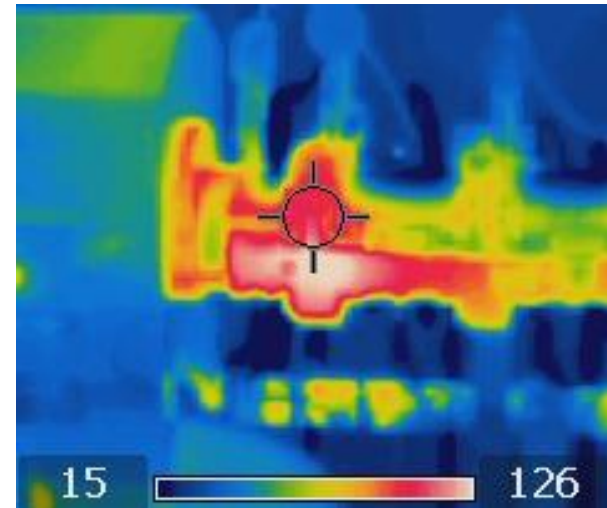
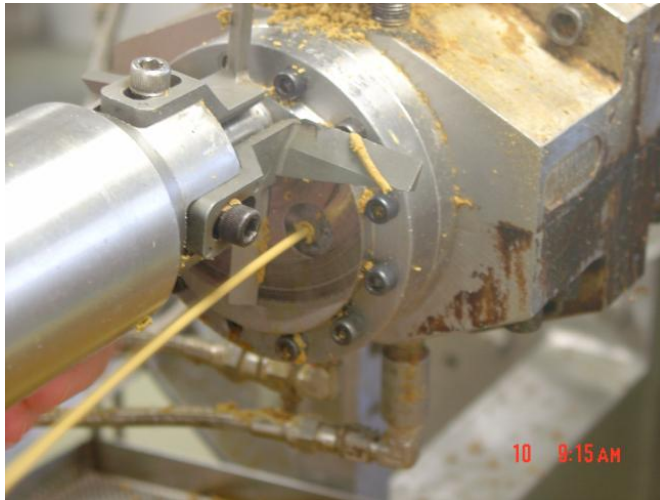
- Fiber & protein separation
 - Upstream may be better



EVOLVING COPRODUCTS

- Using coproducts (wet or dry) to grow other organisms
 - Algae
 - Single-cell proteins
 - Fermentation of DDGS & soybean meal
 - Fungal cells for protein

AQUACULTURE



Nile Tilapia



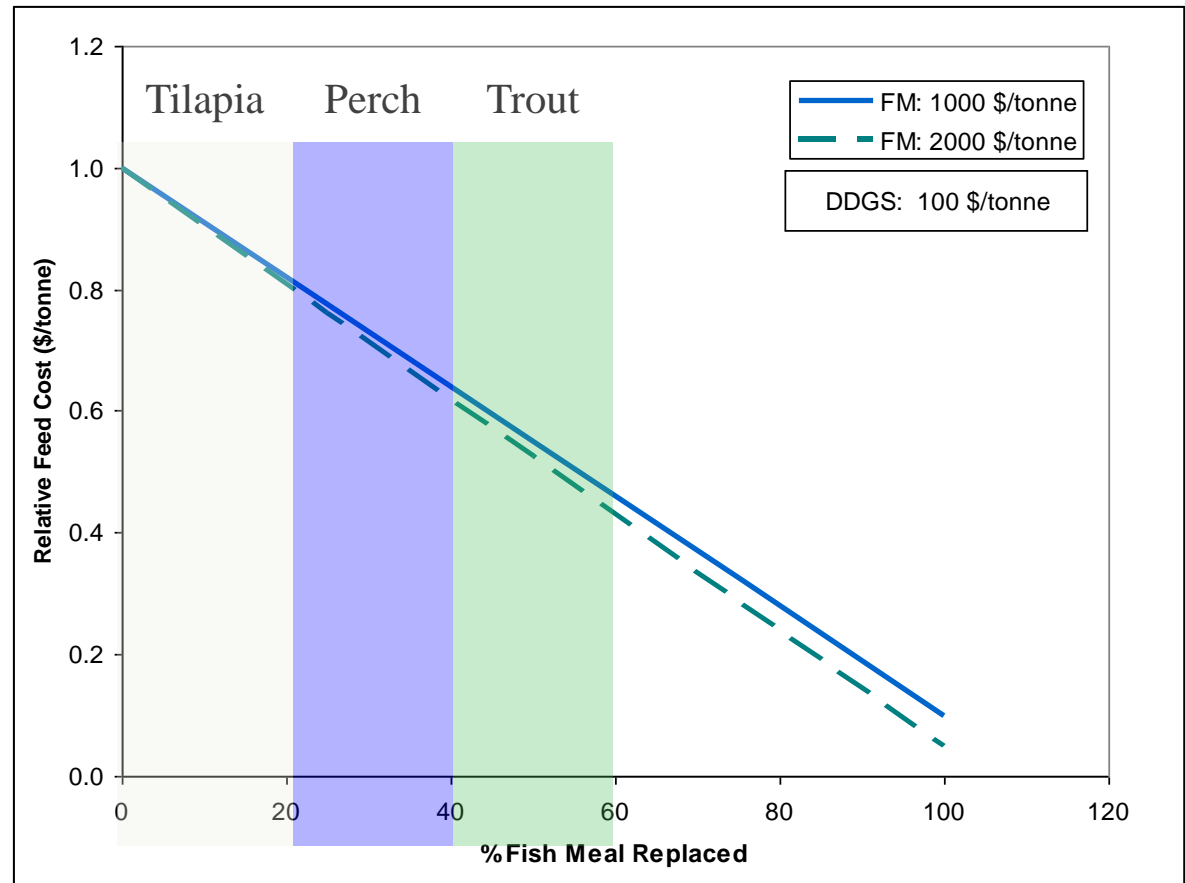
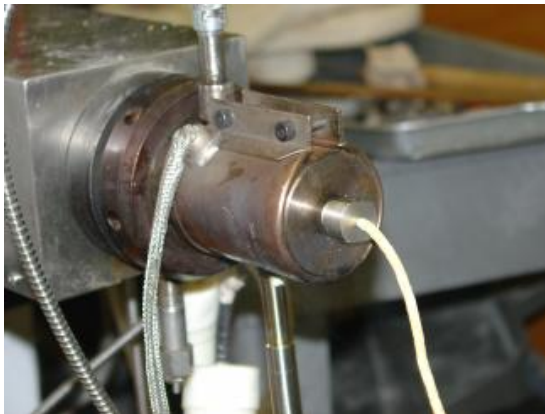
Yellow Perch



Rainbow Trout

AQUACULTURE

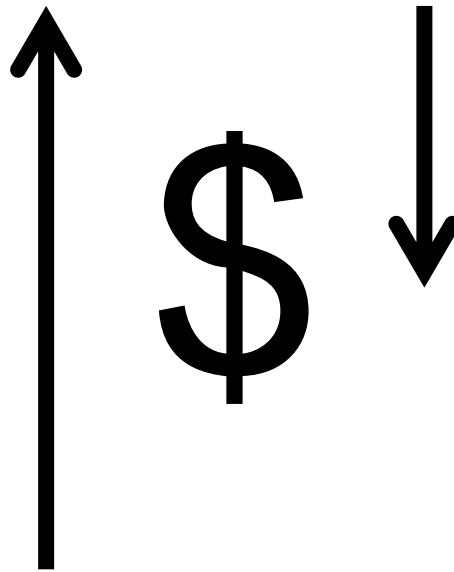
- DDGS ~ 1/10 to 1/20 the price of fish meal





OTHER ISSUES

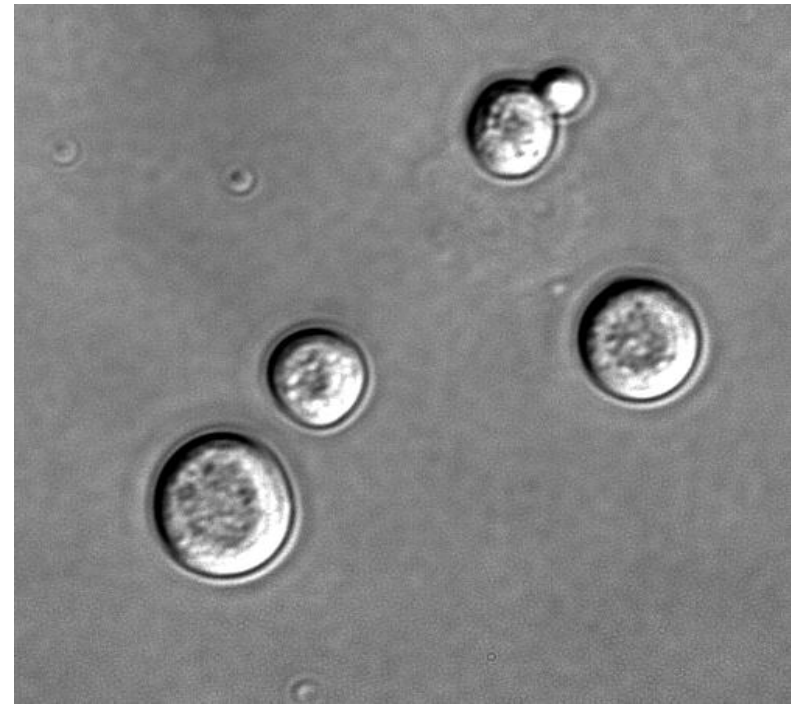
INCLUSION RATES



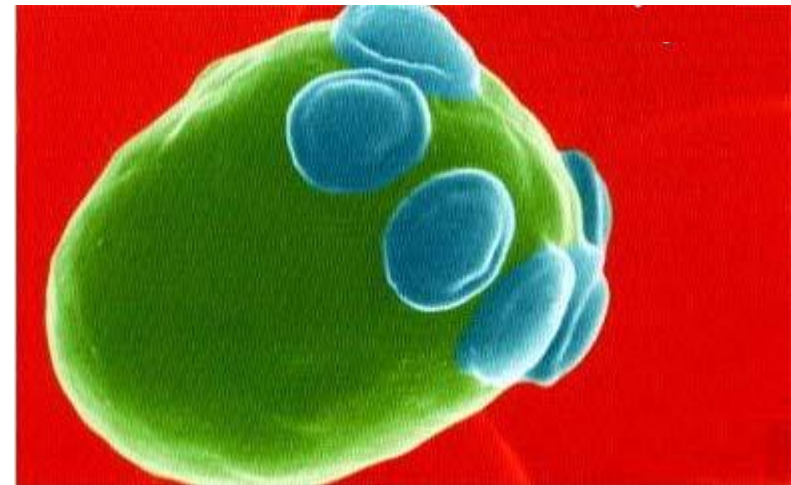
YEAST CELLS

How much protein addition?

- Bauerfeind et al. (1944)
 - 4×10^9 cells/g dried syrup (CDS)
 - ~ 20% of syrup
- Ingeldew (1999)
 - DDGS by mass: 3.9%
 - 5.3% of the DDGS protein
- Belyea et al. (2004)
 - 50% of the DDGS protein
- Han and Liu (2010)
 - 20% of the DDGS protein



Saccharomyces cerevisiae



YEAST CELLS

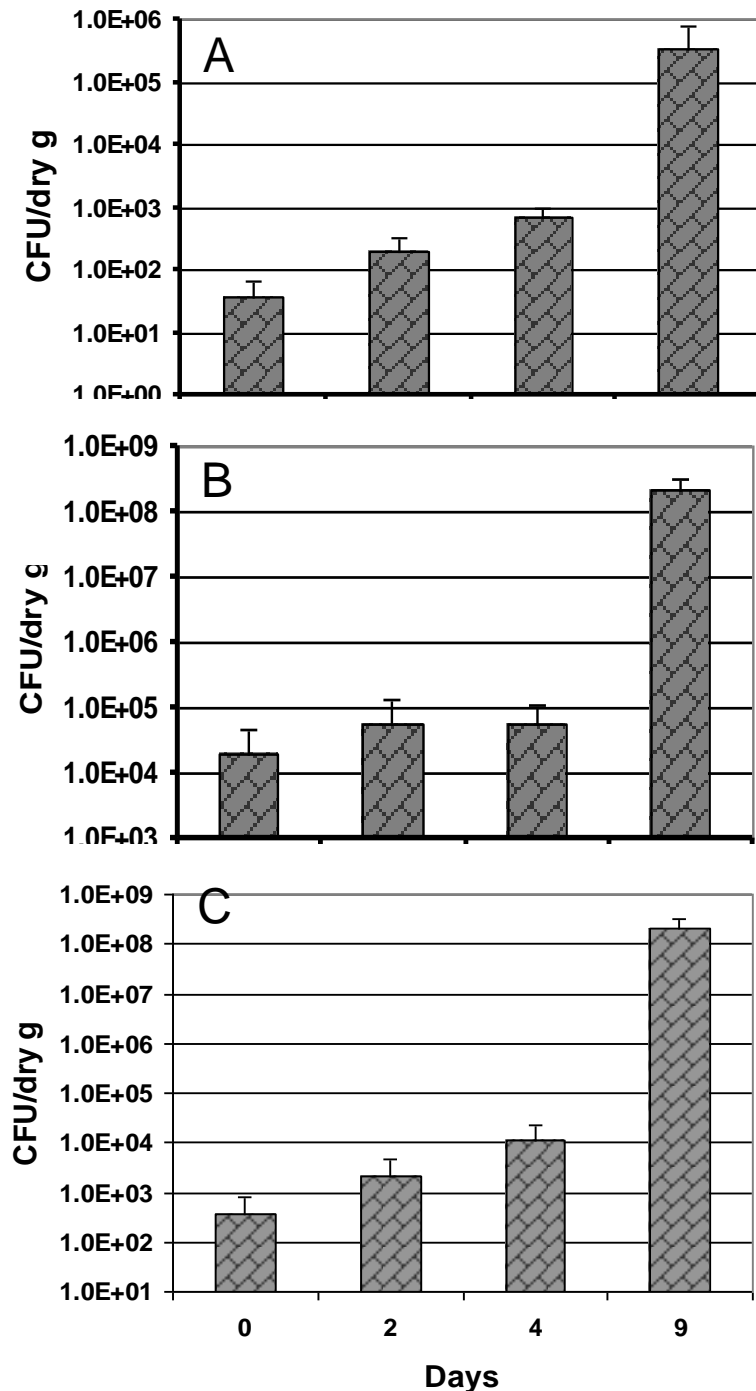
How much residual microbes?

- Yeast have pro-biotic effects in livestock diets
 - Spent grains are already inoculated
- But: spoilage organisms also present

A. Lactic-acid bacteria (*Pediococcus pentosaceus*)

B. Aerobic heterotrophs (*Micrococcus luteus*)

C. Yeasts and molds



AAFCO

“Feed is food”

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AAFCO
Association of American Feed Control Officials

[AAFCO Secure Site Login](#)

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Refund & Return Policies
Check Sample Program
Check Sample Data Reporting Website
The Business of Pet Food
Ingredient Definitions Committee**

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IDC - INGREDIENT DEFINITIONS COMMITTEE

Welcome

Welcome to the ingredient definitions committee page. The actual definitions are published annually in the AAFCO Official Publication (OP). This book is a primary source of revenue to pay for the costs of running the definition process. Your purchase of the OP is appreciated. We understand it may be a burden to purchase an OP to get one definition and in those cases recommend you contact your state department of agriculture or look for the AAFCO Official Publication at your local Library. ([click here for a full list of state contacts](#)).

These definitions apply to all animal feeds. Many pet food manufacturers have tighter specifications than these definitions. We recommend talking with your pet food company about the ingredients and sources they use.

Contact Information:

If you have questions about how ingredients are defined by AAFCO, you may contact the Chair of the Ingredient Definitions Committee:

Richard TenEyck
OR Dept. of Ag.
Animal Health & ID Div.
635 Capitol Street NE
Salem, OR 97301-2532
Telephone: ☎ (503) 986-4691
Fax: (503) 986-4734
E-mail: rteneyck@oda.state.or.us

Ingredient Definitions Committee Forum:

- For Committee Members and Advisors: http://www.aaftco.org/committees/Ingredient_Definitions/login.asp
- Anyone may view meeting agendas at: http://www.aaftco.org/committees/Ingredient_Definitions/agendas.asp
- Anyone may view proposed definitions at: http://www.aaftco.org/committees/Ingredient_Definitions/investigator-recs.asp

Ingredient Definitions Committee - Forms & Information:

1. A Guide to Submitting New Ingredient Definitions to AAFCO (PDF, updated 02/2012)
2. Investigator Form - Word (DOC) version
3. Link to [AAFCO Investigators](#)

Powerpoint Presentations (available in PDF format only):

- Color Additives Used in Animal Food
- by Mika Alewynse, FDA - Midyear 2014
- Information for an Ingredient Definition Submission
- by Sharon Benz, CVM, FDA

AAFCO

- Already have definitions established for sales of distillers coproducts

Common Acronym	Official Name	Official Definition for Trade
DDGS	Corn Distillers Dried Grains with Solubles	"Is the product obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain or a grain mixture by condensing and drying at least ¾ of the solids of the resultant whole stillage by methods employed in the grain distilling industry. The predominating grain shall be declared as the first word in the name."
DDG	Corn Distillers Dried Grains	"Is obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain or a grain mixture by separating the resulting coarse grain fraction of the whole stillage and drying it by methods employed in the grain distilling industry. The predominating grain shall be declared as the first word in the name."
DWG (WDG)	Distillers Wet Grains	"Is the product obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain mixture. The guaranteed analysis shall include the maximum moisture."
CDS (syrup)	Corn Condensed Distillers Solubles	"Is obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain or a grain mixture by condensing the thin stillage fraction to a semi-solid. The predominating grain must be declared as the first word in the name."
DDS	Corn Distillers Dried Solubles	"Is obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain mixture by condensing the thin stillage fraction and drying it by methods employed in the grain distilling industry. The predominating grain must be declared as the first word in the name."

AAFCO

Definition Number: **T33.10** Name: **_____ Distillers Oil, Feed Grade**

Text/Description:

T33.10 _____ Distillers Oil, Feed Grade is obtained after the removal of ethyl alcohol by distillation from the yeast fermentation of a grain or a grain mixture and mechanical or solvent extraction of oil by methods employed in the ethanol production industry. It consists predominantly of glyceride esters of fatty acids and contains no additions of free fatty acids or other materials obtained from fats. It must contain, and be guaranteed for, not less than 85% total fatty acids, not more than 2.5% unsaponifiable matter, and not more than 1% insoluble impurities. Maximum free fatty acids and moisture must be guaranteed. If an antioxidant(s) is used, the common or usual name must be indicated, followed by the words "used as a preservative". If the product bears a name descriptive of its kind or origin, i.e. "corn, sorghum, barley, rye", it must correspond thereto with the predominating grain declared as the first word in the name.

FDA



U.S. Food and Drug Administration

Protecting and Promoting *Your* Health

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Guidance & Regulation

Food Safety Modernization Act (FSMA)

The Law, Rules & Guidance

How to Comment on FSMA

Fact Sheets & Presentations

Frequently Asked Questions

Speeches, Videos, & Webinars

FDA Actions to Date

Resources for You

- FSMA Blog
- The Rulemaking Process (a video tutorial)
- FSMA 101 (a video tutorial)
- Translations of Key FSMA Resources
- Foodborne Illness Outbreaks

FDA Food Safety Modernization Act (FSMA)

The FDA Food Safety Modernization Act (FSMA), the most sweeping reform of our food safety laws in more than 70 years, was signed into law by President Obama on January 4, 2011. It aims to ensure the U.S. food supply is safe by shifting the focus from responding to contamination to preventing it.

Stay connected with FSMA E-mail Updates!

Spotlight

- Domestic and Foreign Facility Reinspection, Recall, and Importer Reinspection Fee Rates for Fiscal Year 2015
- FDA to Reopen Comment Period on Reportable Food Registry ANPR
- Operational Strategy for Implementing the FDA Food Safety Modernization Act (FSMA)
- Questions and Answers for Brewers/Distillers on the FSMA Proposed Rule for Preventive Controls for Animal Food
- Clarification on Using Wood Shelving in Artisanal Cheesemaking
- All Released Materials by Date

Progress in Implementing the Act

View information on how FDA is progressing in implementing the FSMA mandates.

- Progress Reports on Implementing the FSMA
2013 October - December Progress Report Now Available!
- Produce & Preventive Controls Alliances
- Reports & Studies
- Meetings & Outreach

Contact Us

FSMA@fda.hhs.gov
Food and Drug Administration
5100 Paint Branch Pkwy
Wiley Building, HFS-009
Attn: FSMA Outreach
College Park, MD 20740



Most Popular

- Information by Topic
- Full Text of the Law
- Public Meetings
- Presentations
- Rules and Guidance for Industry

Proposed Rules

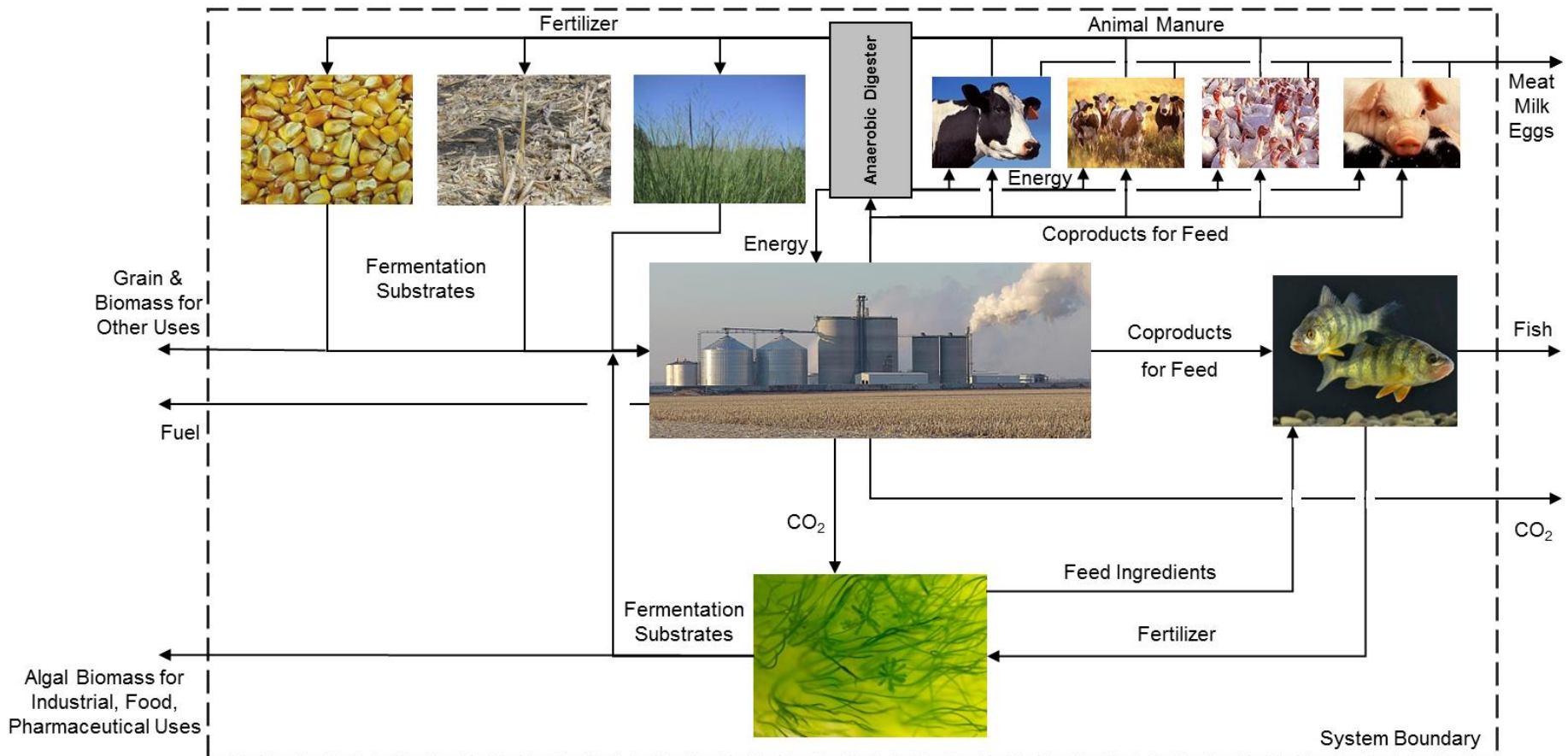
- Sanitary Transportation of Human and Animal Food
- Intentional Adulteration of Food
- Produce Safety
- Preventive Controls for Human Food
- More Rules

For Farmers

- Toolkit for Farmers - resources on the proposed rule for produce safety (PDF - 282KB)
- Statement on Key Provisions of the Proposed Rules Affecting Farmers

- Human food processors
 - Only CGMP to worry about is contamination when holding
- If further processing (drying)
 - Very small business < \$2.5 million sales of animal food
 - 3 years to comply

FINAL THOUGHTS





DISTILLERS GRAINS TECHNOLOGY COUNCIL

"Increasing the awareness of the value of Distillers Grains"



THANK YOU

Questions?
Comments?

Kurt Rosentrater

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